FORM PTO-1390 (Modified) (REV 5-93) U.S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		016782-0242
		U.S. APPLICATION NO. (If known, see 37 C.F R. 1.5) Unassigned 10/019830
INTERNATIONAL APPLICATION NO. PCT/EP00/05157	INTERNATIONAL FILING DATE 5 June 2000	PRIORITY DATE CLAIMED 23 June 1999

TITLE OF INVENTION
DIESEL EXHAUST FILTER SYSTEM WITH ELECTRICAL REGENERATION

APPLICANT(S) FOR DO/EO/US
Willy MARRECAU and Geert DEVOOGHT

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   - ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   - ☒ has been transmitted by the International Bureau.
   - ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   - ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   - ☐ have been transmitted by the International Bureau.
   - ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   - ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).
11. ☐ Applicant claims small entity status under 37 CFR 1.27 .

Items 12. to 17. below concern other document(s) or information included:

12. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
13. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
14. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☒ Other items or information: Application Data Sheet

U.S. APPLICATION NO. (If known, see 37 C.F.R 1.50)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
Unassigned 10/018830	PCT/EP00/05157	016782-0242

18. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO.................................$890.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482)..$710.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2) $740.00		
Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO $1,040.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of $130.00 for furnishing the oath or declaration later than 20 Months from the earliest claimed priority date (37 CFR 1.492(e))		

Claims	Number Filed		Included in Basic Fee		Extra Claims		Rate		
Total Claims	14	-	20	=	0	×	$18.00	$0.00	
Independent Claims	1	-	3	=	0	×	$84.00	$0.00	
Multiple dependent claim(s) (if applicable)							$280.00		
TOTAL OF ABOVE CALCULATIONS =								$890.00	
Reduction by ½ for filing by small entity, if applicable.								$0.00	
SUBTOTAL =								$890.00	
Processing fee of $130.00 for furnishing English translation later the 20 months from the earliest claimed priority date (37 CFR 1.492(f). +									
TOTAL NATIONAL FEE =								$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +									
TOTAL FEES ENCLOSED =								$890.00	
					Amount to be: refunded			$	
					charged			$	

a. ☒ A check in the amount of $890.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 19-0741 in the amount of $0.00 to the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0741. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Foley & Lardner
Customer Number: 22428

22428

PATENT TRADEMARK OFFICE

SIGNATURE

NAME GLENN LAW

REGISTRATION NUMBER 34,371

Atty. Dkt. No. 016782-0242

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Willy MARRECAU et al.

Title: DIESEL EXHAUST FILTER SYSTEM WITH ELECTRICAL REGENERATION

Appl. No.: Unassigned

Filing Date: December 21, 2001

Examiner: Unassigned

Art Unit: Unassigned

PRELIMINARY AMENDMENT

Commissioner for Patents
Box PCT
Washington, D.C. 20231

Sir:

Prior to examination, Applicants respectfully request that the above-identified application be amended as follows:

In the Claims:

7. (Once Amended) A system according to claim 1, said system further comprising electrical contacts at one end of said strips, said contacts enabling electrical energy be supplied to said strips in order to regenerate said strips.

13. (Once Amended) A system according to claim 1, said system further comprising an electrode to ionize fine particles of the diesel exhaust gas so that said fine particles are caught by the strips or so that they conglobe together to be caught by the strips.

002.682844.1

REMARKS

Applicant respectfully requests that the foregoing amendments be made prior to examination of the present application. The amendments are made to correct multiple dependencies and do not change the scope of the invention.

Respectfully submitted,

Date December 21, 2001

By ______________________

Glenn Law
Attorney for Applicants
Registration No. 34,371

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002.682844.1

MARKED UP VERSION OF AMENDED CLAIMS

7. (Once Amended) A system according to [any one of the preceding claims] claim 1, said system further comprising electrical contacts at one end of said strips, said contacts enabling electrical energy be supplied to said strips in order to regenerate said strips.

13. (Once Amended) A system according to [any one of the preceding claims] claim 1, said system further comprising an electrode to ionize fine particles of the diesel exhaust gas so that said fine particles are caught by the strips or so that they conglobe together to be caught by the strips.

10/018830
PCT/EP00/05157

DIESEL EXHAUST FILTER SYSTEM WITH ELECTRICAL REGENERATION

Field of the invention.

The present invention relates to a diesel exhaust filter system which filters particulate matter and which can be regenerated in an electrical way.

Background of the invention.

Diesel exhaust filter systems, which can be regenerated in an electrical way, are known in the art.

One of the main problems with these systems is that they involve a high degree of electrical power which may cause substantial charge losses to the vehicle battery and which increases the consumption of fuel.

US-A-5,207,807 solves this problem of high power consumption by a modular concept of these parts of the filter, which need to be electrically regenerated. These filter parts are electrically conductive but are electrically insulated from one another and can be cyclically and selectively supplied with electrical power in order to regenerate them.

The complete filter system, however, is large and not practical to be incorporated in the exhaust system of stationary and non-stationary diesel engines.

Summary of the invention.

It is an object of the present invention to simplify the embodiments of the prior art.

It is another object of the invention to reduce the length of the filter system substantially and to make it a very compact design.

It is also an object of the present invention to minimize the electrical power needed for regeneration.

It is also an object of the invention to realize homogenous temperature during the regeneration cycle to eliminate the risk of hot spots and consequently extending the life.

It is yet another object of the present invention to provide a very compact all in one diesel exhaust system addressing the noise, the particulate matter and all other polluting organic fractions such as HC,CO and NO_x present in the diesel exhaust gases aiming maximum performance within a minimum design envelop resulting in lowest possible weight.
It is another object of the present invention not only filtering the heavy particles in the diesel exhaust gases but also for filtration of the small particles.
It is an object of the present invention to include the catalytic function downstream the filter strips in the same design.

According to the invention, there is provided a diesel exhaust filter system which comprises :

- a carrier in the form of a tube or alike, the carrier has radially permeable parts ;
- one or more porous filter strips, these strips are electrically conductive and are wrapped helically around the carrier in a number of windings (each winding being a 360° revolution around the carrier), the windings are do not touch each other, they are laterally separated from each other and cover the radially permeable parts ;
- insulation means to electrically insulate the windings from each other. These electrical insulation means may also thermally insulate the windings from each other.

By wrapping the filter strips around the carrier, longer filter strips can be used while the overall dimensions of the filter are reduced.

In a suitable embodiment the carrier is a tube such as a stainless steel tube having perforations to make the carrier radially permeable.
In another embodiment the carrier can also be a tube made of a highly porous sintered metal fiber medium.

Preferably the filter strips are sintered stainless metal fiber strips made of a stainless steel which is both heat resistant and corrosion resistant. Such stainless steels are known in the art and comprise suitable amounts of chromium, aluminium, yttrium ... An example of composition is between 15 and 22 weight per cent chromium, between 4 and 5.2 weight per cent aluminium, between 0.05 and 0.5 weight per cent yttrium, between 0.2 and 0.4 weight per cent silicon and less than 0.03 per cent carbon.

The advantages of these metal fiber strips is that they have a high degree of porosity combined with a small filter rating and a very low thermal mass made of a high temperature resistant stainless steel alloy. The filter media used is marketed under the registered trademark of BEKIPOR®. The high degree of porosity reduces the backpressure to a very minimum and safeguards in this way the functioning of the diesel engine. The small filter rating safeguards capturing most of the particulate matter including the small ones. The low thermal mass safeguards fast response to reach the required temperature in a minimum of time, requiring a low amount of electrical power.

The amount of fiber used is a determining factor for the required electrical power to regenerate. A smaller amount of fiber could be compensated by smaller diameter fiber to maintain filter rating and dirt holding capacity.

Typical ranges for the metal fiber diameters useful for diesel exhaust filters are between 12 micrometer and 22 micrometer.

In an embodiment of the invention, an inorganic porous fabric in the form of a sleeve is placed between the carrier and the filter strips and functions as electrical and thermal insulating layer between the filter strips and the carrier. Such inorganic porous fabric must be electrically insulating, thermally insulating and resistant against high temperatures.

Another function of the inorganic porous fabric is to seal the filter strips at their border. A suitable example is a cloth braided from silicon carbide, quartz, aluminosilicate or borosilicate fiber tows. On or more sleeves may be provided one above the other.

In an alternative embodiment of the invention, a porous layer of aluminiumoxide, e.g. sputtered on the carrier, functions as electrical insulating layer between the filter strips and the carrier.

In a preferable embodiment of the invention, a wire is wrapped and fixed, e.g. welded, to the carrier in order to keep adjacent windings of the filter strips separated from each other.
Arranging a spring around the carrier may provide an alternative. Preferably the spring diameter is smaller than the diameter of the carrier so that the spring exerts a pressure on the carrier.

One or more inorganic porous fabrics in the form of sleeves cover the filter strips for good thermal insulation safeguarding low electrical consumption.

The system according to the invention further comprises electrical contacts attached at one end of the filter strips. These contacts enable electrical power to be supplied to the strips in order to regenerate them. In contrast with the filter strips, these contacts must have an electrical resistance, which is as small as possible since it is of no use to heat up the contacts during regeneration. In order to lower the electrical contact resistance, these contacts comprise a steel wire mesh, which is sintered to the filter strips and to an electrical conductor. A lightweight wire mesh sandwiched between two layers of fiber is advantageous to enhance uniform temperature avoiding hot spots during regeneration and extend life. Another advantage of the wire mesh is the possibility to custom tailor the electrical resistivity without altering the filter rating.

The principle of using a metal mesh to lower the electrical resistance of the contacts with a strip is not limited to the present invention of diesel exhaust filters made of helically wound strips and can be extended to other metal fiber strips where electrical regeneration or electrical heating is required.

Another metal fiber medium may be added to the system. Having regard to the relatively high external surface provided by the individual metal fibers in this metal fiber medium and to the open matrix structure of a metal fiber medium, the added metal fiber medium of the diesel exhaust filter system, or of the carrier if this is made of a sintered metal fiber medium, can function as a substrate for a catalytic converter to reduce the soluble organic fractions as HC, CO and NO_x in the diesel exhaust gases.

Instead of adding another metal fiber medium to the system, the metal fiber strips which function as filters for particulate matter, may also function as substrate for a catalytic converter.

Preferably, the catalytic reduction of the gases occurs at a second separate upstream or downstream module, while the first downstream or upstream module functions as a particle trap.
The added metal fiber medium, or as the case may be, the carrier of sintered metal fiber medium, is not regenerated, since this risks to burn the catalysts.

In another improvement, the diesel exhaust system comprises an upstream electrode to ionize fine particulate matter particles present in the diesel exhaust gas so that the filter strips catch even fine particles. As a first example hereof, the fine particles are electrically loaded and are caught by the filter strips, which are also electrically loaded.

In a second example, the fine particles are electrically loaded so that they conglobe together to form thicker particles so that they can be caught by the filter strips.

Yet another advantage of the present invention is that it considerably reduces the noise generated from the combustion of the diesel engine. This noise reduction is even of such a degree that muffler is no longer required.

Brief description of the drawings.

The invention will now be described into more detail with reference to the accompanying drawings wherein

- FIGURE 1 schematically illustrates a principal part of a diesel exhaust filter system according to the invention ;
- FIGURE 2 illustrates how an electrical contact can be made between a filter strip and an electrical conductor ;
- FIGURE 3 gives a global view of a diesel exhaust filter system according to the invention.

Description of the preferred embodiments of the invention.

FIGURE 1 illustrates a carrier 10 in the form of a stainless steel tube provided with perforations 12 which are spread over a zone 14 which extends in a helical way in different windings over the carrier 10. A steel wire 16 in the form of a helix is fixed, e.g. welded, to the carrier 10. A porous ceramic fabric 18, e.g. made of braided silica tows and in the form of a sleeve, is put over the carrier and the wire. A filter strip 20 of a sintered metal fiber fabric is wrapped helically over the carrier so that it covers the perforated zone 14 and forms a number of windings (each winding = 360° revolution). The windings are laterally separated from each other. The function of porous fabric 18 is to electrically insulate

and to thermally insulate the carrier 10 (and the steel wire 16) from filter strip(s) 20. The steel wire 16 prevents adjacent windings of the filter strip from contacting each other and/or from moving towards each other. In addition, a second porous ceramic fabric 21 (only partially shown on FIGURE 1) in the form of a sleeve covers the filter element in order to limit the thermal losses during regeneration, and as a consequence to further limit the electrical power required for regeneration. If required for obtaining a good thermal insulation, several layers of ceramic fabric may be provided. Ceramic fabric 21 functions as a thermal insulation.

The carrier 10, the steel wire 12, the porous fabric 18, metal fiber filter strip 20 and porous fabric 21 form a composite filter tube 22.

Typical dimensions for a metal fiber filter strip 20 are :

- width = 31.75 mm (1.25")
- length = 1016 mm (40")
- thickness = 1 mm

Examples of electrical values are :

- resistance R = 0.600 Ohm
- voltage V = 58 Volt
- current I = 19 Ampère
- average power consumption : P = 0.75 kiloWatt (average = over a period of time) ; fuel penalty (i.e. additional fuel consumption due to additional required power) is limited to 1.5%
- regeneration time needed per filter element is less than one minute.

More generally, the above values may range in the following way :

- width : from 10 mm to 50 mm ;
- length : from 500 mm to 1500 mm ;
- thickness : from 0.4 mm to 1.3 mm ;
- resistance : 0.6 Ohm to 5.0 Ohm ;
- voltage : 12 Volt to 70 Volt ;

- current : 5 Ampère to 100 Ampère.

Such a composite filter tube 22 is relatively compact in design and has only a low pressure drop. A second similar filter tube can be put in series to reduce the finest particles in a second phase to reach higher filter efficiencies up to 99% and higher.

In an alternative embodiment, the stainless steel tube is provided with perforations over the whole surface of its casing. A flat wire is helically wrapped around the tube and creates in this way helical zones with perforations between the windings of the flat wire. The filter strips are then wrapped between the windings of the flat wire.

More than one layer of filter strips 20 can be wrapped on the carrier, one above the other, but each layer is preferably separated from the previous one by means of an insulating porous fabric.

At the end of metal fiber filter strip 20 a metal mesh may be sintered to it, in order to realize an electrical contact of reduced resistance with an electrical conductor.
Connecting an electrical conductor to a metal fiber filter strip is not straightforward having regard to the small thermal mass of the filter strip. The filter strips risks to be burned in case of welding. Sintering an electrical conductor together with a metal mesh 24 to the filter strip has proven to provide an adequate solution. Preferably the metal mesh is made of a highly conducting material which can be sintered to the filter strip. An example of such a material is a nickel-chromium alloy. NiCr has an electrical resistivity of 112 micro ohm/K. Copper and aluminium meshes, although having a high electrical conductivity, are not suitable to be sintered.

FIGURE 2 illustrates in detail another embodiment to obtain a good electrical contact at the end of the metal fiber filter strips 20.
The following layered structure is obtained :

- a metal fiber strip 20 ;
- a metal mesh 24 ;
- an electrical conductor 26 where, e.g. the ends of the composing filaments present flare to increase the contact surface ;
- a metal mesh 24 ;
- a metal fiber strip 20.

The parts of the two metal meshes 24, which are sticking out of the layered structure, are bent over 180 degrees one on top and one on the bottom. Extra weight is placed on the edges of the layered structure and the whole is then sintered together.
As explained above, the realization of such an electrical contact is not limited to the present invention.

FIGURE 3 gives a global view of the functioning of a diesel exhaust filter system according to the invention.
The system has two or more parallel modules 28, 30, according to the size of the engine. In the case of FIGURE 3, module 30 is in operation, i.e. functions as a filter, and module 28 is switched in an off-line status and can be regenerated. So regeneration occurs off-line, i.e. when the module is not in operation.
The exhaust gases follow the direction of the arrows. Pipings 32 conduct the dirty exhaust gases from the exit of the diesel engine 34 to filter modules 28 and 30. Exit pipings 36 conduct the cleaned exhaust gases from modules 28 and 30 to the environment. Each module 28, 30 can be provided with one or more composite filter tubes 22 as illustrated in FIGURE 1.
Exit pipings 36 can be provided with valves 38 and 40. In the case of FIGURE 3, valve 38 closes module 28 so that this module becomes off-line and that this module can be electrically regenerated. Valve 40

leaves module 30 in operation so that nothing prevents the diesel engine from continuing to operate.

As filtering proceeds, the pressure drop over the composite filter tubes becomes greater and greater. This drop can be monitored and once a certain level passed for one or another module, the module can be switched off-line to regenerate. In this way regeneration is only done when necessary and electrical power is used in an efficient way.

The diesel exhaust system can also be equipped with one or more electrodes 42, which charge electrostatically any fine particles present in the exhaust gases. The filter strips 20 themselves can also be charged electrically and may function as a precipitation electrode to hold the fine particles. During the regeneration phase the filter strips are heated above the ignition temperature of the fine particles so that these are removed. Such a system for removing fine particles is disclosed in EP-B1-0 650 551.

CLAIMS

1. A diesel exhaust filter system comprising :
   a carrier in the form of a tube or alike,
      said carrier having radially permeable parts,
   said system further comprising one or more porous filter strips,
      said strips being electrically conductive,
      said strips being wrapped around said carrier in a number of windings, said windings being separated from each other,
      said strips covering said radially permeable parts,
   said system further comprising insulation means to electrically insulate said windings from each other.

2. A system according to claim 1 wherein said carrier is a tube having perforations in said radially permeable parts.

3. A system according to claim 1 wherein said carrier is made of sintered stainless metal fibers.

4. A system according to claim 1 wherein said strips are metal fiber strips.

5. A system according to claim 2 wherein said insulation means comprise an inorganic porous fabric positioned between the carrier and the strips.

6. A system according to claim 2, said system further comprising a metal wire wrapped around said carrier and adapted to keep adjacent windings of the strips separated from each other.

7. A system according to any one of the preceding claims, said system further comprising electrical contacts at one end of said

strips, said contacts enabling electrical energy be supplied to said strips in order to regenerate said strips.

8. A system according to claim 7 wherein said electrical contacts comprise a metal mesh.

9. A system according to claim 7 wherein said electrical contacts comprise a metal plate.

10. A system according to claim 8 wherein said metal mesh has been sintered to said strips.

11. A system according to claim 4 wherein said filter strips function as a substrate for a catalytic converter.

12. A system according to claim 4, said system further comprising metal fiber media which function as a substrate for a catalytic converter.

13. A system according to any one of the preceding claims, said system further comprising an electrode to ionize fine particles of the diesel exhaust gas so that said fine particles are caught by the strips or so that they conglobe together to be caught by the strips.

14. A system according to claim 1, said system further comprising thermal insulation means which cover at least said filter strips.

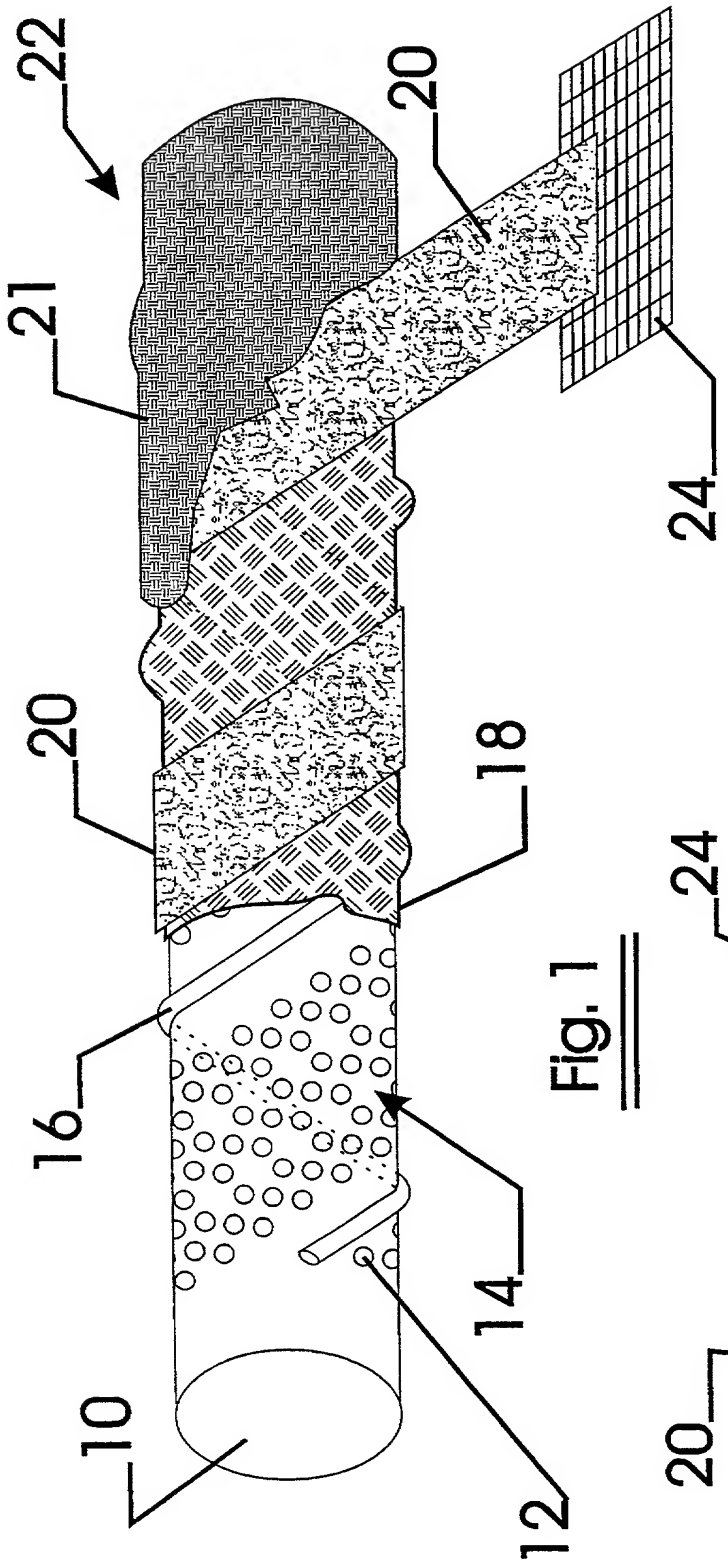

Fig. 1

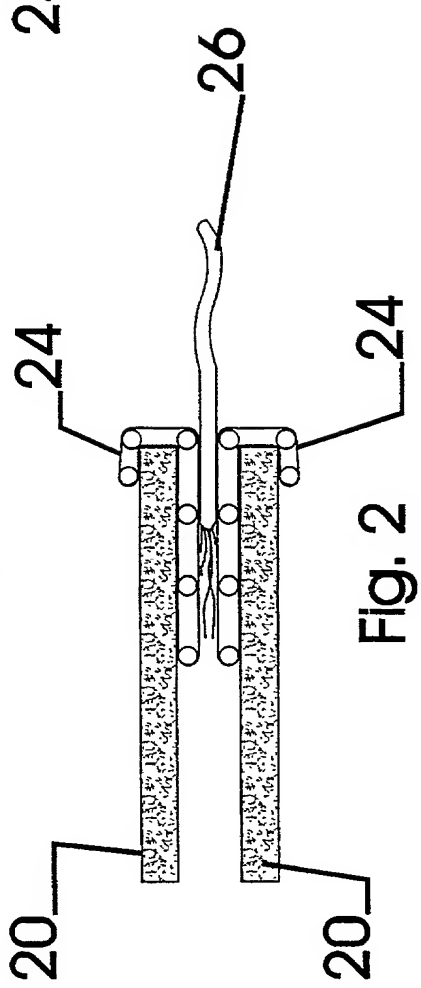

Fig. 2

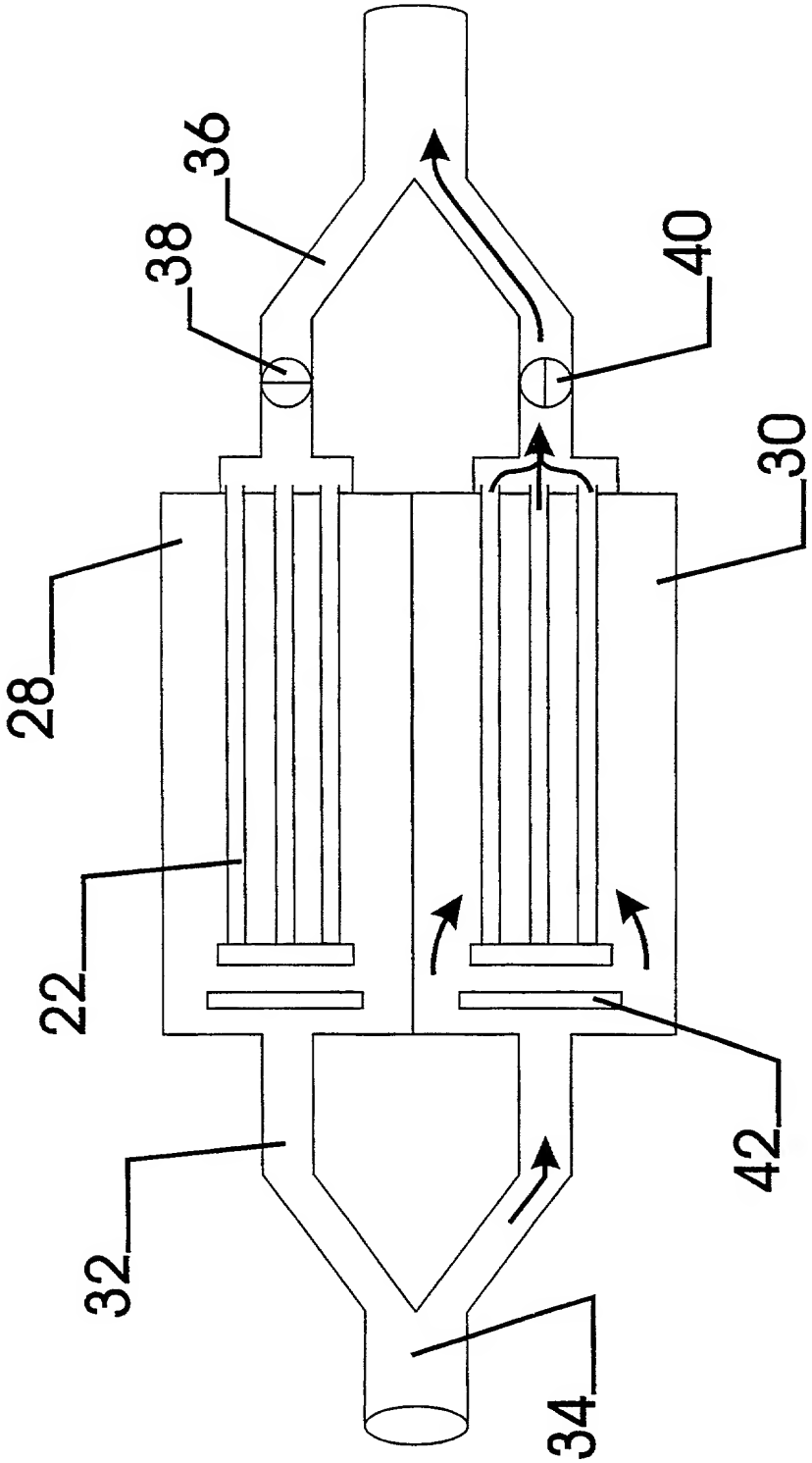

Fig. 3

#4

Atty. Dkt. No. 016782-0242

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DIESEL EXHAUST FILTER SYSTEM WITH ELECTRICAL REGENERATION

(Attorney Docket No. 016782-0242)

the specification of which (check one)

____ is attached hereto.

_X_ was filed on June 5, 2000 as United States Application Number or PCT International Application Number PCT/EP00/05157 and was amended on _____ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?
99202013.1	EPO	June 23, 1999	YES	

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER:

STEPHEN A. BENT	Reg. No. 29,768
DAVID A. BLUMENTHAL	Reg. No. 26,257
BETH A. BURROUS	Reg. No. 35,087
ALAN I. CANTOR	Reg. No. 28,163
WILLIAM T. ELLIS	Reg. No. 26,874
JOHN J. FELDHAUS	Reg. No. 28,822
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GLENN LAW	Reg. No.	34,371
PETER G. MACK	Reg. No.	26,001
STEPHEN B. MAEBIUS	Reg. No.	35,264
BRIAN J. MC NAMARA	Reg. No.	32,789
RICHARD C. PEET	Reg. No.	35,792
GEORGE E. QUILLIN	Reg. No.	32,792
ANDREW E. RAWLINS	Reg. No.	34,702
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CHARLES F. SCHILL	Reg. No.	27,590
RICHARD L. SCHWAAB	Reg. No.	25,479
MICHELE M. SIMKIN	Reg. No.	34,717
HAROLD C. WEGNER	Reg. No.	25,258

to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith.

I request that all correspondence be directed to:

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I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1-00

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2-OD

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